MEDICAL SCIENCE MONITOR

MEDICAL TECHNOLOGY

e-ISSN 1643-3750
© Med Sci Monit, 2018; 24: 5132-5138
DOI: 10.12659/MSM.906970

Received: 2017.09.05
Accepted: 2018.03.01
Published: 2018.07.24

Computed Tomography-Guided Superior Hypogastric Plexus Block for Secondary Dysmenorrhea in Perimenopausal Women

Authors' Contribution:
Study Design A
Data Collection B
Statistical Analysis C
Data Interpretation D
Manuscript Preparation E
Literature Search F
Funds Collection G

E Xiaomin Yang
B Jihong You
B Suping Tao
D Xin Zheng
F Keyue Xie
A Bing Huang

The First Hospital of Jiaxing, Jiaxing, Zhejiang, P.R. China

Corresponding Author: Bing Huang, e-mail: 13511328099@163.com
Source of support: Departmental sources

Background: Refractory abdominal pain during menstruation severely affects patients' quality of life and simultaneously places enormous psychological burdens on patients and their families. Several treatments for secondary dysmenorrhea are available; however, none can permanently treat all types of secondary dysmenorrhea. Since pain is transmitted by the nerves, we hypothesized that a neurolytic block could be used as a treatment for refractory abdominal pain during menstruation. We sought to investigate the therapeutic efficacy and safety of computed tomography (CT)-guided superior hypogastric plexus block for secondary dysmenorrhea.

Material/Methods: We performed CT-guided neurolytic block of the superior hypogastric plexus by bilaterally administering 4 mL of a dehydrated alcohol solution in 25 patients from January 2014 to February 2016. The degree of pain and its impact on the patients' mood and quality of life were evaluated using the visual analogue scale, Hospital Anxiety and Depression Scale, and 36-Item Short Form Survey before and after therapy, and the data were statistically analyzed using analysis of variance and *t* test.

Results: The degrees of pain were significantly ($p<0.05$) decreased after neurolytic block (from 7.74±1.14 to 2.96±1.55). The patients showed significantly ($p<0.05$) less anxiety and improved bodily pain with mental health status.

Conclusions: Secondary dysmenorrhea can be effectively and safely treated with a neurolytic block of the superior hypogastric plexus.

MeSH Keywords: Nerve Block • Hypogastric Plexus • Dysmenorrhea

Full-text PDF: https://www.medscimonit.com/abstract/index/idArt/906970

Indexed in: [Current Contents/Clinical Medicine] [SCI Expanded] [ISI Alerting System] [ISI Journals Master List] [Index Medicus/MEDLINE] [EMBASE/Excerpta Medica] [Chemical Abstracts/CAS]

Background

Secondary dysmenorrhea is defined as menstrual pain that is often due to uterine adenomyosis or pelvic endometriosis [1]. It is characterized by severe symptoms, various patterns of manifestation, a long duration, and periodic episodes, and its incidence is approximately 33.19% in women of childbearing age. Secondary dysmenorrhea is caused by pelvic organ diseases and is more common in women after childbirth or in middle-aged women. Among these cases, 80% are attributed to endometriosis or uterine adenomyosis, but other diseases such as chronic pelvic inflammatory disease can also cause this symptom [2]. Uterine adenomyosis or pelvic endometriosis is a disease in which the endometrial tissue grows outside of the uterine cavity (e.g., in the ovaries, other locations in the pelvic cavity, or the uterine myometrium) [1]. Concerning the symptomology of secondary dysmenorrhea, distending pain, burning pain, sharp pain, dull pain, bearing-down pain, colicky pain, cramping pain, and tearing pain can occur periodically in the hypogastrium. Moreover, some patients have pain-stress symptoms, including headache, dizziness, nausea, and vomiting, which severely affect their quality of life.

Currently, several treatments for secondary dysmenorrhea are available. The treatment is often personalized and optimized according to disease severity and patient age; however, no simple and direct method can permanently treat all types of secondary dysmenorrhea. Although the oral administration of some contraceptive drugs and non-steroidal anti-inflammatory drugs can effectively treat most patients with secondary dysmenorrhea, 20~25% of patients do not respond to all the methods mentioned above, and still have pain during their menstrual periods [3]. Operative treatment can relieve chronic pelvic pain in some patients with uterine endometriosis or adenomyosis; however, such treatment also carries the risk of injury or other surgical complications. Furthermore, refractory abdominal pain during menstruation severely affects patients' quality of life and simultaneously places enormous psychological burdens on patients and their families [4].

The superior hypogastric plexus consists of the lumbar splanchnic nerves (from the L3–L4 sympathetic ganglia) and the abdominal aortic plexus, which distributes its fibers to the anterior sacral promontory of the L5 vertebral body below the iliac bifurcation of the abdominal aorta. Transection of the anterior sacral plexus as a treatment for secondary dysmenorrhea has gradually developed into a laparoscopic procedure involving sacral nerve transection, even using robotic operation [3,5–8]. Sacral nerve intervention has been shown to block pelvic pain and to have an analgesic effect [9]. Therefore, we explored a more convenient, microinvasive operation that relieves pain through a neural block.

Since pain is a sensation transmitted by the nerves and given the recent progress in the use of neurolytic blocks, we hypothesized that a neurolytic block could be used as a treatment for refractory abdominal pain during menstruation [10]. In this study, we describe a clinical application of computed tomography (CT)-guided neurolytic block of the superior hypogastric plexus in 25 perimenopausal patients with secondary dysmenorrhea in whom conservative treatment was not effective. Thereby, we present a simple, long-acting analgesic treatment for secondary dysmenorrhea.

Material and Methods

Patients

Twenty-five perimenopausal patients with secondary dysmenorrhea who visited our hospital from January 2014 to February 2016 were recruited. All patients had a treatment history within the preceding half-year period that included analgesic drug use that was determined to be ineffective. Preoperatively, examinations were conducted to exclude diseases of the hematologic and immune systems, and there was no severe dysfunction of any important organ (i.e., the heart, brain, kidneys, liver, and lungs). This study was approved by the Ethics Committee of the First Hospital of Jiaxing. The diagnostic criterion for secondary dysmenorrhea was hypogastric-cramping pain that occurs periodically during menstruation and tends to be progressively aggravated and is confirmed to be secondary to pelvic endometriosis or uterine adenomyosis.

We included subjects if: (i) an ultrasonogram indicated uterine adenomyosis, with a slight increase of the cancer antigen (CA)-125, or (ii) there was a history of relevant endometriosis operation along with the absence of surgical indications for immediate reoperation. Patients who satisfied either criterion were then included if they met all the following additional criteria: (iii) periodic hypogastric pain during menstruation, with a visual analogue scale (VAS) score >6 (severe); (iv) age >40 years; (v) absence of menorrhagia and significant pelvic mass; and (vi) absence of dysmenorrhea due to intrauterine devices. Among the patients who satisfied these criteria, we enrolled those who provided written informed consent to undergo an operation.

We excluded patients who: (i) were nulliparous; (ii) had complications due to other pelvic diseases; (iii) recently developed appendicitis or other acute pelvic inflammatory diseases; (iv) had endometriosis localized to a deep portion of the pelvic cavity, which resulted in ureterostenosis or hematochezia; (v) had uterine adenomyosis that was complicated with menorrhagia; (vi) were allergic to alcohol or iohexol; or (vii) declined to undergo an operation or had psychiatric disorders that prevented them from providing consent.

Indexed in: [Current Contents/Clinical Medicine] [SCI Expanded] [ISI Alerting System] [ISI Journals Master List] [Index Medicus/MEDLINE] [EMBASE/Excerpta Medica] [Chemical Abstracts/CAS]

Therapeutic procedures

Preoperatively, we discussed any potential surgical complications and the expected outcomes of CT-guided neurolytic block of the superior hypogastric plexus with the patients and their families. Written informed consent was then obtained from the patients or their families. After confirming the absence of any contraindications to a neural block, an intravenous infusion channel was opened, and the patients were brought to the CT operating room. The patients were asked to lie in a prone position on an operative bed, and a pillow was placed under their abdomen. CT scans were used to confirm the location of the L5 and S1 intervertebral spaces, which were the target regions for puncture. Then, we centered the puncture interspace and obtained a coronal CT scan that consisted of contiguous 5-mm slices above, below, and at the center, with a slice thickness of 3 mm. From the CT images, an optimal puncture slice was selected, and then the puncture paths were planned. A paravertebral puncture was conducted with the anterolateral margin of the L5 vertebral body as the left boundary and the anterior margin of the psoas major muscle as the right boundary. Intervertebral disc puncture was conducted below the iliac bifurcation of the abdominal aorta. After the puncture paths were planned, the puncture points were confirmed bilaterally, and the angle and depth of the puncture points were measured with a CT ruler. Next, the puncture was directed to the relative target point through CT-guided needle placement (Figure 1). A solution of 2% lidocaine containing iohexol (a contrast agent) was injected, and its distribution was observed on a CT rescan. An injection site was determined as appropriate if: (i) the lidocaine-iohexol solution was distributed along the anteromedial margin of the psoas major muscle and the anterior vertebral body (Figure 2), and (ii) a loss of sensation bilaterally in the lower limbs without dyskinesia was observed after 15 min. With the injection site confirmed, a contrast medium of dehydrated alcohol solution (4 mL) containing 3% iohexol (0.5 mL) was injected bilaterally to achieve a neurolytic block of the superior hypogastric plexus. This was followed by repeat CT and three-dimensional reconstruction to observe the distribution of the dehydrated alcohol solution (Figure 3). During therapy, the patient's heart rate, blood pressure, and blood oxygen saturation level were recorded. Any complications were also recorded.

Assessments of therapeutic efficacy

The VAS was used to assess pain. The VAS ranged from 0 (no pain) to 10 (unbearable pain). By using the VAS, the patients placed a mark at the point indicating their pain intensity (score 0–3: mild pain, score 4–7: moderate pain, score 7–10: severe pain). Twenty-five patients were assessed for menstrual pain intensity and deep-intercourse pain before and after therapy. We assessed the efficacy of therapy based on the following outcomes: (i) complete relief, an almost absence of pain after therapy with a VAS score of 0–2; (ii) partial relief, menstrual pain score of 3–5 after therapy; (iii) no efficacy, no decrease in

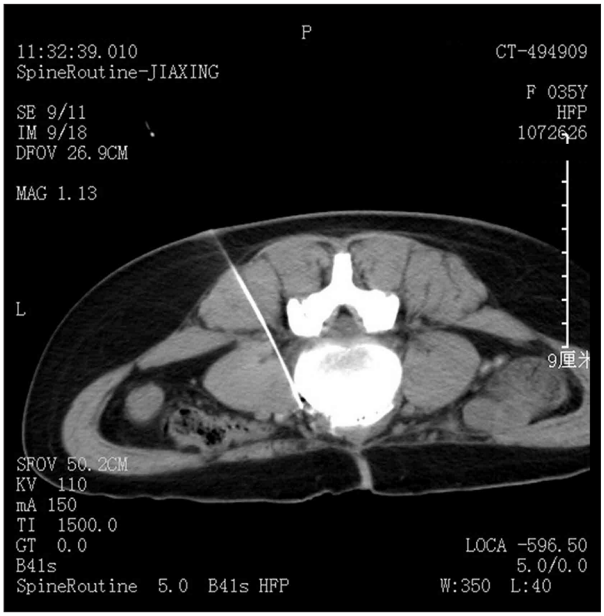

Figure 2. Computed tomography scan indicating that the injection drug fluid is distributed along the anteromedial margin of the psoas major muscle and the anterior vertebral body.

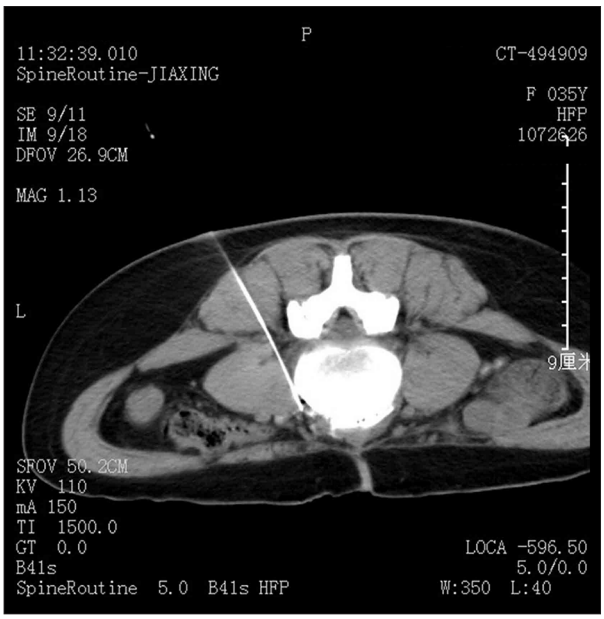

Figure 1. A needle puncturing the target point under computed tomographic guidance (left side: puncture toward the anterolateral margin of the L5 vertebral body and the anterior margin of the psoas major muscle through paravertebral puncture; right side: puncture below the iliac bifurcation of the abdominal aorta through intervertebral disc puncture).

Indexed in: [Current Contents/Clinical Medicine] [SCI Expanded] [ISI Alerting System] [ISI Journals Master List] [Index Medicus/MEDLINE] [EMBASE/Excerpta Medica] [Chemical Abstracts/CAS]

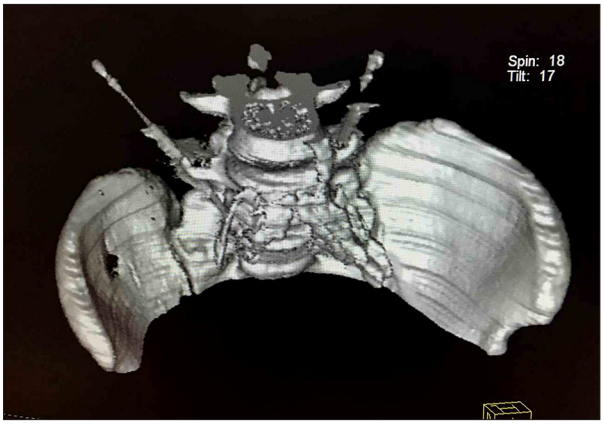

Figure 3. Three-dimensional reconstruction after computed tomography indicating that the dehydrated alcohol solution is distributed along the anterior margin of the L5 and S1 vertebral bodies and the anteromedial margin of the psoas major muscle.

the intensity of menstrual pain after therapy with a VAS score of >5; and (iv) relapse, appearance of a similar symptom during menstruation after pain relief during the postoperative 3 months with a pain intensity being the same as or higher than that before the operation.

The Hospital Anxiety and Depression Scale (HADS) [11] was used for the assessment, with a total score of 0–7 indicating no depression or anxiety, a total score of 8–10 indicating possible or threshold depression or anxiety, and a total score of 11–20 indicating possibly significant depression or anxiety. From the quality of life index scale (36-Item Short Form Survey [SF-36]) [12], we used 4 subtests: general health (GH) was used to assess personal health and developmental state; bodily pain (BP) was used to assess pain intensity and impact on daily activities; mental health (MH) was used to assess 4 MH items, including encouragement, suppression, behavioral or emotional outburst, and psychological or subjective perception; and reported health transition (HT) was used to assess the total change in the patient's health status within the past 1 year. According to the SF-36 scoring method, a higher score indicated a better health status.

Follow-up

Postoperative follow-up was conducted at 1, 3, 6, and 12 months after therapy by the physicians responsible for outpatient care. At each follow-up, the patient's uterine size; menstrual state (categorized as normal, low, or excessive); and levels of hemoglobin, serum CA-125, serum estradiol, follicle-stimulating hormone (FSH), and luteinizing hormone (LH) on day 3 of menstruation were measured and recorded at the corresponding time points. Any change in pain intensity was recorded and assessed by using the VAS.

At the final follow-up (1 year postoperatively), the HADS and SF-36 were completed in addition to the routine follow-up items. Furthermore, changes in daily mood and quality of life were assessed according to the preoperative results.

Statistical analysis

VAS scores, used to assess menstrual pain intensity before and after therapy, were analyzed with analysis of variance. Anxiety, depression, and quality of life before and after therapy were analyzed by using the *t* test. $p<0.05$ was considered statistically significant. All statistical analyses were performed with SPSS software, version 19 (IBM Corp., Chicago, IL, USA).

Results

The patients' mean age was 42.6±4.1 years (range, 43–49 years). The average disease course was 7.46±2.26 years (range, 3–11 years). All patients presented with severe cramping pain in the lower abdomen during menstruation, and 11 patients experienced deep-intercourse pain. According to the symptoms, clinical manifestations, and ultrasonographic results, 11 patients were diagnosed as having uterine adenomyosis, and 14 patients were laparoscopically diagnosed as having relapsed menstrual abdominal pain after the endometriosis operation.

All 25 patients had moderate and severe menstrual pain preoperatively, with a VAS score of 7.74±1.14. At 1, 2, 3, 6, and 12 months after superior hypogastric plexus block (Table 1), the VAS scores for menstrual pain were statistically significantly lower than those before therapy ($p<0.05$), as shown in Figure 1. Two patients had a postoperative hemoglobin level <9 g/dL because of menorrhagia and underwent hysterectomy 1.5 years later. The coagulation time and levels of the aforementioned blood lipids, serum estradiol, FSH, and LH on day 3 of menstruation were within the normal range before and after therapy. Except for the previously mentioned 2 patients who were removed from this study, the other patients had no changes in uterine size, menstrual volume, or CA-125 level after therapy. The 1-year complete and partial relief rates in patients with secondary dysmenorrhea were 30.4% and 52.2%, respectively, with the overall success rate being 82.6%, as shown in Table 2.

After the superior hypogastric plexus block, patients' HADS scores were significantly lower than before therapy, and there was a significant difference in the anxiety state after therapy. However, there was no difference in the depression score (Table 3). We used 4 subscales of the SF-36 to assess the difference in the quality of life after therapy. As a result, we found that there was a significant difference in BP and MH after therapy. With respect to HT, 69.6% of patients subjectively believed that their health had significantly improved (Figure 3).

Indexed in: [Current Contents/Clinical Medicine] [SCI Expanded] [ISI Alerting System] [ISI Journals Master List] [Index Medicus/MEDLINE] [EMBASE/Excerpta Medica] [Chemical Abstracts/CAS]

Table 1. Changes in VAS scores for patients with secondary dysmenorrhea after therapy.

Categories	VAS	F value	P value
Before therapy	7.74±1.14		
1 month after therapy	2.96±1.55	4.44	0.045
3 months after therapy	2.94±2.02	2.55	0.023
6 months after therapy	3.60±2.02	10.58	0.003
12 months after therapy	4.58±1.99	6.77	0.017

VAS – visual analogue scale.

Table 2. Changes in abdominal pain during menstruation after therapy.

	1 month	3 months	6 months	12 months
	Cases 25	Cases 25	Cases 25	Cases 23
Complete alleviation	13 (52.0%)	11 (44.0%)	9 (36.0%)	7 (30.4%)
Partial alleviation	11 (44.0%)	12 (48.0%)	13 (52.0%)	12 (52.2%)
Total effective rate	24 (96.0%)	23 (92.0%)	22 (88.0%)	19 (82.6%)
Inefficiency/relapse rate	1 (4%)	2 (8%)	3 (12%)	4 (17.4%)

Table 3. Changes in anxiety and depression scores and quality of life indices after therapy.

		Before therapy	1 year after therapy	P value
		Cases 25	Cases 23	
The Hospital Anxiety and Depression Scale HADS				
HAD-A		11.92±5.38	9.30±5.13	0.03
HAD-D		10.52±7.91	8.01±6.78	0.08
SF-36				
General health (GH)		41.67±2.43	56.32±3.22	0.98
Bodily pain (BP)		48.19±4.77	72.12±2.98	0.01
Mental health (MH)		45.12±3.29	79.12±5.28	0.03
Reported Health Transition (HT)	Much better than one year before		16 (69.6%)	
	Better than one year before		6 (26.1%)	

HAD – Hospital Anxiety and Depression; SF-36 – 36-Item Short Form Survey.

None of the 25 patients had abnormal neural dysfunction or other complications due to the therapy in this study.

Discussion

Most patients with secondary dysmenorrhea have endometriosis and uterine adenomyosis, and the therapeutic principles for dysmenorrhea have been confirmed as follows [13]: reduction or removal of lesions, relief or amelioration of pain, improvement in fertility, and reduction or prevention of relapse. Currently, the main therapeutic methods include: operative treatment (i.e., excision, hysterectomy, bilateral uterine adnexectomy, or sacral nerve transection); medication (i.e., gonadotropin-releasing hormone drugs, contraceptive drugs, and testosterone derivatives); use of slow-release intrauterine devices (to create an elevated localized concentration of progesterone that exerts an antagonistic effect on endometrial hyperplasia); and uterine artery intervention [14]. However, all these treatment options have serious risks. Given the invasive nature of operative treatment, related surgical complications may occur. Indeed, radical surgery is directly associated

Indexed in: [Current Contents/Clinical Medicine] [SCI Expanded] [ISI Alerting System] [ISI Journals Master List] [Index Medicus/MEDLINE] [EMBASE/Excerpta Medica] [Chemical Abstracts/CAS]

with postoperative improvement in symptoms and the possibility of relapse [15]. Furthermore, the adverse effects of medication use restrict the broad use of drugs [16]. Additionally, slow-release intrauterine devices easily cause abnormal vaginal bleeding and have no effect on severe abdominal pain during menstruation in some patients [17]. Moreover, although uterine artery intervention has some therapeutic efficacy in treating menorrhagia and dysmenorrhea, the treatment outcomes are closely associated with uterine vascular distribution and the collateral circulation [18]. Finally, non-target embolization produces some degree of adverse effects.

Pelvic pain and infertility due to endometriosis are basic issues that affect the health and quality of life of patients and require extensive research. In the treatment of endometriosis, the development of a personalized treatment plan that considers the patient's age, plans for fertility, degrees of symptoms, disease location and range, past treatment, and other desired outcomes is needed [19]. In this study, we recruited patients who had previously given birth, had no plans for pregnancy, were perimenopausal, exhibited exacerbated dysmenorrhea, and were refractory to the effects of medication. Further, dysmenorrhea secondary to endometriosis and uterine adenomyosis is an estrogen-dependent benign disease. When estrogen levels decrease after menopause, atrophy of the uterine and ectopic endometrium occurs. As a result, the symptoms of dysmenorrhea naturally disappear, and the disease spontaneously resolves, unless hormone replacement therapy is administered [20]. These observations are helpful in determining the aggressiveness of treatment. In the perimenopausal phase, if there is no menorrhagia and anemia, then surgery is not required to treat the disease. Nevertheless, a reduction in menstrual abdominal pain before menopause improves the patient's quality of life and prevents short-term and long-term surgical complications.

In recent years, with the developments in pain medicine, CT-guided precise neurolytic blockage of the splanchnic nerves has been widely used in various visceral cancer pain [21] and non-pain disorders (e.g., hyperhidrosis and Raynaud's disease[22]). Percutaneous superior hypogastric plexus block has been shown to have a significant therapeutic effect on refractory pelvic pain due to late-stage tumors [21]. The aforementioned study results verified that the neural function was modulated by percutaneous drug injection. Therefore, it has been speculated that CT-guided precise neurolytic block of the superior hypogastric plexus can block the ascending pelvic visceral pain pathway to the central sensory neurons, thereby achieving an analgesic effect. Secondary dysmenorrhea is a type of self-limited pelvic visceral pain (i.e., spontaneous resolution after menopause). If pain can be effectively relieved before menopause, then no operation is needed. Here, we presented an alternative therapeutic approach for secondary dysmenorrhea using CT-guided superior hypogastric plexus block. This method was demonstrated to be less invasive and able to provide much more effective analgesia. Our results indicated that improvements in pain symptoms after therapy in turn improved the anxiety and depressive state as well as the quality of life of patients. HADS and SF-36 were used to assess the pain levels and quality of life preoperatively and at 1-year follow-up postoperatively [4,8,23].

Dehydrated alcohol can cause localized demyelination of neural fibers, dehydration of neural cells, and protein coagulation, thereby resulting in degeneration [24]. After precise localization with CT guidance, we used dehydrated alcohol together with a small amount of contrast agent to demyelinate the target nerves. This produced an effect of blocking the transmission of nerve pain. However, including a contrast agent dilutes the dehydrated alcohol solution and weakens its neurolytic effect, which was associated with a gradual weakening of the analgesic effect in patients at follow-up. Nevertheless, no severe complications were observed. Therefore, in later investigations, we plan to titrate the concentration of alcohol (neurolytic agent) or use other neurolytic agents to further enhance the therapeutic efficacy.

Conclusions

The results of this study indicate that CT-guided superior hypogastric plexus block partially or completely relieved menstrual abdominal pain and significantly reduced the occurrence of anxiety and depression, and significantly enhanced the quality of life of patients without producing any severe complications. Thus, this method is an ideal treatment for perimenopausal women with secondary dysmenorrhea. However, the sample size of this study was small and the follow-up time was only 1 year. Therefore, the long-term therapeutic efficacy and safety of this treatment need to be studied further.

Conflicts of interest

None.

Indexed in: [Current Contents/Clinical Medicine] [SCI Expanded] [ISI Alerting System] [ISI Journals Master List] [Index Medicus/MEDLINE] [EMBASE/Excerpta Medica] [Chemical Abstracts/CAS]

References:

1. Vercellini P, Vigano P, Somigliana E et al: Endometriosis: Pathogenesis and treatment. Nat Rev Endocrinol, 2014; 10(5): 261–75
2. Sinaii N, Plumb K, Cotton L et al: Differences in characteristics among 1,000 women with endometriosis based on extent of disease. Fertil Steril, 2008; 89(3): 538–45
3. Holloran-Schwartz MB: Surgical evaluation and treatment of the patient with chronic pelvic pain. Obstet Gynecol Clin North Am, 2014; 41(3): 357–69
4. Bryant C, Cockburn R, Plante A et al: The psychological profile of women presenting to a multidisciplinary clinic for chronic pelvic pain: High levels of psychological dysfunction and implications for practice. J Pain Res, 2016; 9: 1049–56
5. Garcia LF, Oviedo OG, Reyes CH et al: [Presacral neurectomy and uterine nerve ablation in chronic pelvic pain. Laparoscopic management. A comparative study]. Ginecol Obstet Mex, 2003; 71: 137–42 [in Spanish]
6. Yuan CC: Laparoscopic uterosacral nerve ablation and chronic pelvic pain. J Chin Med Assoc, 2006; 69(3): 101–3
7. Kapetanakis V, Jacob K, Klauschie J et al: Robotic presacral neurectomy – technique and results. Int J Med Robot, 2012; 8(1): 73–76
8. Nezhat C, Morozov V: Robot-assisted laparoscopic presacral neurectomy: Feasibility, techniques, and operative outcomes. J Minim Invasive Gynecol, 2010; 17(4): 508–12
9. Abdelaziz S, Ghaleb A: Combined sacral nerve roots stimulation and low thoracic spinal cord stimulation for the treatment of chronic pelvic pain. Pain Studies & Treatment, 2014; 02(2): 86–90
10. Jiang C, Cheng Z: Update of recent studies of adenomyosis-associated dysmenorrhea. Gynecology & Minimally Invasive Therapy, 2016; 5(4): 137–40
11. Snaith RP: The hospital anxiety and depression scale. Health Qual Life Outcomes, 2003; 1: 29
12. Su CT, Ng HS, Yang AL et al: Psychometric evaluation of the Short Form 36 Health Survey (SF-36) and the World Health Organization Quality of Life Scale Brief Version (WHOQOL-BREF) for patients with schizophrenia. Psychol Assess, 2014; 26(3): 980–89
13. Scarselli G, Rizzello F, Cammilli F et al: Diagnosis and treatment of endometriosis. A review. Minerva Ginecol, 2005; 57(1): 55–78
14. Kavoussi S K, Lim CS, Skinner BD et al: New paradigms in the diagnosis and management of endometriosis. Curr Opin Obstet Gynecol, 2016; 28(4): 267–76
15. Zhou Y, Zhao W, Wang H: Impact of surgical management of deep infiltrating endometriosis on relief of pain. Anhui Medical Journal, 2016
16. Tsui K H, Lee WL, Chen CY et al: Medical treatment for adenomyosis and/or adenomyoma. Taiwan J Obstet Gynecol, 2014; 53(4): 459–65
17. Majeroni BA: Multiple complaints in a tired woman with vaginal bleeding. Cortlandt Forum, 2007
18. Englander MJ: Uterine artery embolization for the treatment of adenomyosis. Semin Intervent Radiol, 2008; 25(4): 387–93
19. Cranney R, Condous G, Reid S: An update on the diagnosis, surgical management, and fertility outcomes for women with endometrioma. Acta Obstet Gynecol Scand, 2017; 96(6): 633–43
20. Jeon DS, Kim TH, Lee HH et al: Endometriosis in a postmenopausal woman on hormonal replacement therapy. J Menopausal Med, 2013; 19(3): 151–53
21. Yarmohammadi H, Nakamoto D A, Azar N et al: Percutaneous computed tomography guided cryoablation of the celiac plexus as an alternative treatment for intractable pain caused by pancreatic cancer. J Cancer Res Ther, 2011; 7(4): 481–83
22. Guo J, Fei Y, Huang B et al: CT-guided thoracic sympathetic blockade for palmar hyperhidrosis: Immediate results and postoperative quality of life. J Clin Neurosci, 2016; 34: 89–93
23. Whitaker LH, Reid J, Choa A et al: An exploratory study into objective and reported characteristics of neuropathic pain in women with chronic pelvic pain. PLoS One, 2016; 11(4): e151950
24. Akhan O, Ozmen MN, Basgun N et al: Long-term results of celiac Ganglia block: Correlation of grade of tumoral invasion and pain relief. Am J Roentgenol, 2004; 182(4): 891–96

Indexed in: [Current Contents/Clinical Medicine] [SCI Expanded] [ISI Alerting System] [ISI Journals Master List] [Index Medicus/MEDLINE] [EMBASE/Excerpta Medica] [Chemical Abstracts/CAS]